Claims 1-35 are pending in this application. Claims 1-11 and 25-33 stand rejected. Claims 12-24 and 34-35 are withdrawn from consideration.

Submitted herewith is a Submission Of Marked Up Claims in accordance with 37 C.F.R. § 1.121(c)(1)(ii).

The objection to Claims 6-10 and 28-32 for informalities is respectfully traversed.

Claims 6, 7, 28, and 29 have been amended to recite topping heater.

For the reasons set forth above, Applicants respectfully request that the objection to Claims 6-10 and 28-32 be withdrawn.

The rejection of Claims 6-10 under 35 U.S.C. § 112, second paragraph, is respectfully traversed.

Claim 6 has been amended to recite "A system in accordance with Claim 5 further comprising a topping heater fuel, said topping heater fuel comprises a portion of said oxygen and hydrogen disassociated from said feed water in said high temperature water cracking system." Accordingly, Applicants submit that Claims 6-10 are definite and particularly point out and distinctly claim the subject matter which the Applicants regard as their invention.

For the reasons set forth above, Applicants respectfully request that the Section 112 rejection of Claims 6-10 be withdrawn.

The rejection of Claims 1-11 and 25-33 under 35 U.S.C. § 103(a) as being unpatentable over Koutz (US 4,576,783) in view of either one of Interrante et al. (US 3,821,358) or Wentorf (US 3,842,164) is respectfully traversed.

Koutz describes a system for increasing the temperature of a fluid heated by a high temperature gas cooled nuclear reactor. The system includes a high temperature gas cooled

nuclear reactor and a secondary closed loop of a working fluid. The fluid in the closed loop is heated in an intermediate heat exchanger in communication with the reactor coolant. The system also includes a heat pump to heat the working fluid to about 1500°F. The working fluid is then passed through a hydrogen production generator where the working fluid transfers heat to the hydrogen production generator. The working fluid in the closed loop then passes through a turbine, which is part of the heat pump, which cools the working fluid to about 1080°F. The working fluid is then passed through a steam generator to heat feed water for the hydrogen production generator to about 900°F, and is then directed back to the intermediate heat exchanger.

Claim 1 of the present application recites "a system for generating hydrogen comprising: . . . a liquid metal nuclear reactor having a non-radioactive secondary heat loop comprising a recirculated heat transfer medium; . . . a high temperature water cracking system, said feed water coupled to said water cracking system by a feed water input line, said secondary heat loop and said recirculated heat transfer medium being separate from said high temperature water cracking system; . . . ."

Claim 25 of the present application recites "A system for generating hydrogen comprising: . . . a liquid metal nuclear reactor having a non-radioactive secondary heat loop comprising a recirculated heat transfer medium; . . . a high temperature water cracking system, said feed water coupled to said water cracking system by a feed water input line, said secondary heat loop and said recirculated heat transfer medium being separate from said high temperature water cracking system; . . . ."

Applicants respectfully submit that Koutz does not describe nor suggest a system for generating hydrogen as recited in Claim 1 or a system as recited in Claim 25. Particularly, Koutz has a closed loop heating circuit 22 that includes a working fluid that is heated by the heat exchanger (steam generator) 20, passes through the heat pump (topping heater) 28 where it is heated further, passes through the hydrogen production generator 30 to provide heat to the hydrogen production generator, passes through a steam generator 38 to add heat to the feed water, and then is circulated back to the heat exchanger (steam generator) 20. In contrast, the system recited in Claim 1 and the system recited in Claim 25 include a secondary heat loop and a recirculated heat transfer medium that is separate from the high temperature water cracking system. Specifically, there is no direct interface between the secondary heat loop and the working fluid and the high temperature water cracking system. Koutz specifically describes at Col. 2, line 45 to Col. 3, line 2 that the working fluid in the secondary loop is passed through the reformer 30 during which the working fluid directly transfers heat to the reformer. This means that the secondary loop has a direct interface with the reformer 30 and is not separate. Accordingly, Applicants submit that Claims 1 and 25 are patentable over Koutz.

Interrante et al. and Wentdorf are cited for teaching the use of a liquid metal reactor as a heat source for thermochemical production of hydrogen and oxygen. Interrante et al. and Wentdorf are not cited for, and do not teach or suggest a high temperature water cracking system with the feed water coupled to the water cracking system by a feed water input line coupled in flow communication with the steam generator, the topping heater, and the high temperature water cracking system, and where the reactor secondary heat loop and the recirculated heat transfer medium are separate from the high temperature water cracking system.

Koutz, Interrante et al. and Wentdorf, alone or in combination, do not describe nor suggest a system for generating hydrogen as recited in Claim 1 or a system as recited in Claim 25. Particularly, and as explained above, Koutz, Interrante et al. and Wentdorf, alone or in combination, do not describe nor suggest a system for generating hydrogen that includes a liquid metal nuclear reactor having a non-radioactive secondary heat loop having a recirculated heat transfer medium, and a high temperature water cracking system, with the secondary heat loop and the recirculated heat transfer medium being separate from the high temperature water cracking system. Accordingly Applicants submit that Claims 1 and 25 are patentable over Koutz, Interrante et al. and Wentdorf, alone or in combination.

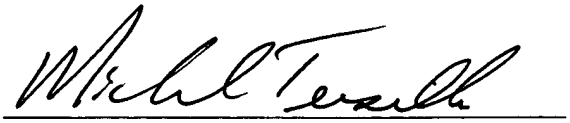
Claims 2-11 depend from independent Claim 1 and Claims 26-33 depend from independent Claim 25. When the recitations of dependent Claims 2-11 and 26-33 are considered in combination with the recitations of Claims 1 and 25 respectively, Applicants respectfully submit that Claims 2-11 and 26-33 likewise patentable over Koutz, Interrante et al. and Wentdorf, alone or in combination.

For the reasons set forth above, Applicants respectfully request that the Section 103(a) rejection of Claims 1-11 and 25-33 be withdrawn.

In view of the foregoing amendments and remarks, all the claims now active in this application are believed to be in condition for allowance. Favorable action is respectfully

solicited.

Respectfully submitted,



Michael Tersillo
Registration No. 42,180
ARMSTRONG TEASDALE LLP
One Metropolitan Square, Suite 2600
St. Louis, Missouri 63102-2740
(314) 621-5070

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Boardman et al.

Art Unit: 3641

Serial No.: 09/735,009

Examiner: R. Calabrica

Filed: December 12, 2000

For: SYSTEM AND METHODS OF PRODUCING HYDROGEN USING A NUCLEAR REACTOR

SUBMISSION OF MARKED UP CLAIMS

Commissioner for Patents
P.O. Box 1450
Arlington, VA 22313

A marked-up version of amended Claims 1, 6, 7, 25, 28, and 29, in accordance with 37 C.F.R. § 1.121(c)(1)(ii), follows below.

MARKED UP CLAIMS

1. (four times amended) A system for generating hydrogen comprising:

feed water;

a liquid metal nuclear reactor having a non-radioactive secondary heat loop comprising a recirculated heat transfer medium;

a steam generator connected to said secondary heat loop, said heat transfer medium and said feed water passing through said steam generator, said steam generator capable of raising the temperature of said feed water;

a high temperature water cracking system, said feed water coupled to said water cracking system by a feed water input line, said secondary heat loop and said recirculated heat transfer medium being separate from said high temperature water cracking system; and

a topping heater, said topping heater capable of raising the temperature of said feed water, said feed water input line coupled in flow communication with said steam generator, said topping heater, and said high temperature water cracking system, said feed water disassociated into hydrogen and oxygen in said high temperature water cracking system.

6. (twice amended) A system in accordance with Claim 5 [wherein] <u>further comprising</u> a [toping] <u>topping</u> heater fuel<u>, said topping heater fuel</u> comprises a portion of said oxygen and hydrogen disassociated from said feed water in said high temperature water cracking system.

7. (twice amended) A system in accordance with Claim 5 further comprising a first regenerative heat exchanger and a [toping] <u>topping</u> heater exhaust line, said exhaust line coupled to said first regenerative heat exchanger to direct exhaust from said gas fired topping heater into said first regenerative heat exchanger, said feed water input line coupled to said first regenerative heat exchanger downstream of said steam generator.

25. (four times amended) A system for generating hydrogen comprising:

feed water;

a liquid metal nuclear reactor having a non-radioactive secondary heat loop comprising a recirculated heat transfer medium;

a steam generator connected to said secondary heat loop, said heat transfer medium and said feed water passing through said steam generator, said steam generator capable of raising the temperature of said feed water to between about 450°C to about 550°C;

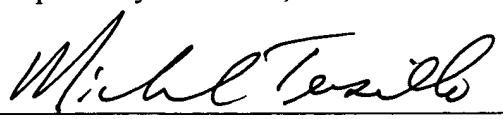
a high temperature water cracking system, said feed water coupled to said water cracking system by a feed water input line, said secondary heat loop and said recirculated heat transfer medium being separate from said high temperature water cracking system; and

a topping heater, said topping heater capable of raising the temperature of said feed water so that said feed water in said high temperature water cracking system is at least about 850°C, said feed water input line coupled in flow communication with said steam generator, said topping heater, and said high temperature water cracking system, said feed water disassociated into hydrogen and oxygen in said high temperature water cracking system.

28. (four times amended) A system in accordance with Claim 27 [wherein a toping] further comprising a topping heater fuel, said topping heater fuel comprises a portion of said oxygen and hydrogen disassociated from said feed water in said high temperature water cracking system.

29. (twice amended) A system in accordance with Claim 27 further comprising a first regenerative heat exchanger and a [toping] topping heater exhaust line, said exhaust line coupled to said first regenerative heat exchanger to direct exhaust from said gas fired topping heater into said first regenerative heat exchanger, said feed water input line coupled to said first regenerative heat exchanger downstream of said steam generator.

Respectfully submitted,



Michael Tersillo
Registration No. 42,180
ARMSTRONG TEASDALE LLP
One Metropolitan Square, Suite 2600
St. Louis, Missouri 63102-2740
(314) 621-5070